openreach

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Suppliers' Information Note
For The Openreach Network

OPENREACH WES AGGREGATION SERVICE

Service & Interface Description

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1 Introduction

This Suppliers Information Note (SIN) describes the Openreach WES Aggregation Service.

Wholesale Extension Services (WES) are high speed, point-to-point data circuits that are permanently connected and available 24 hours a day, 365 days per year. They provide a secure link between a third party customer site and the Communications Provider's (CP's) network at a CP's Site.

WES Aggregation enables up to ten spokes to be aggregated at a common node and handover provided at a handover point as either an aggregated (optical 1Gbit/s) or non- aggregated (10 x RJ45) handover. Each spoke may be either 10Mbit/s or 100Mbit/s. If ten spokes are used then at least one spoke must be at 10Mbit/s.

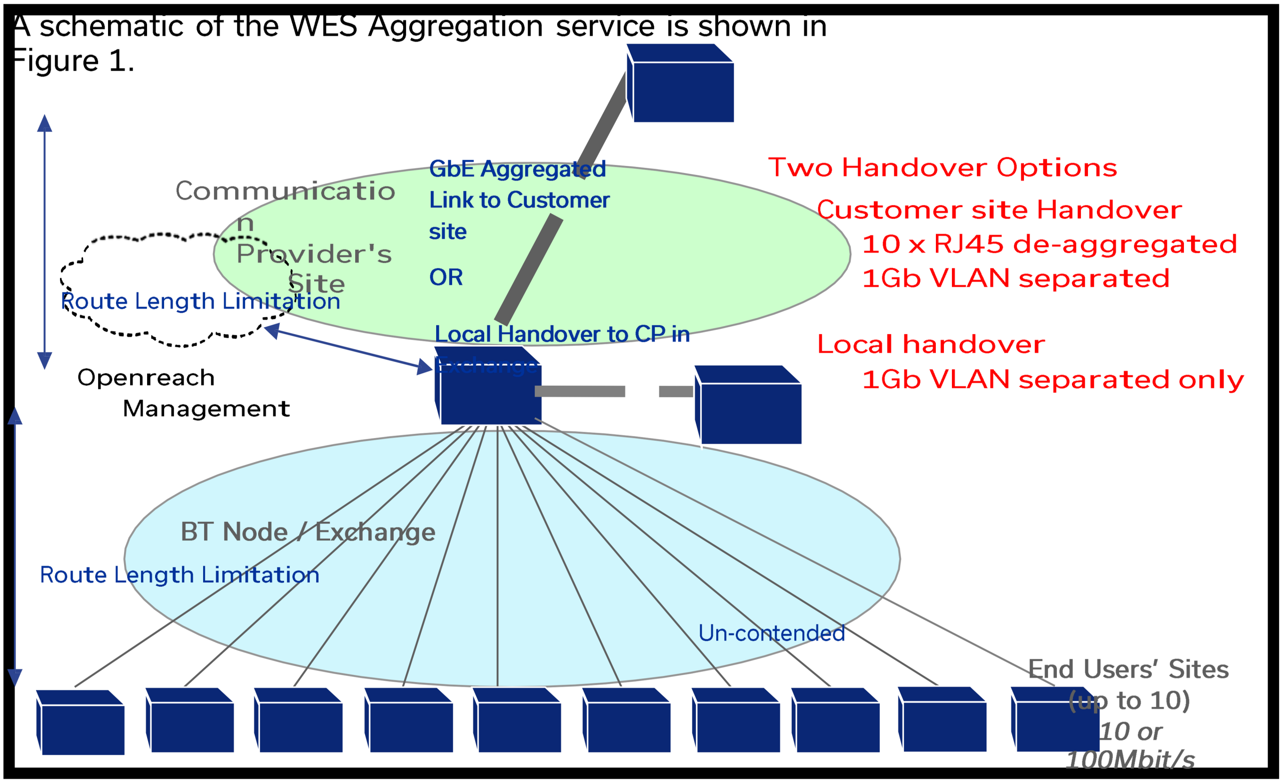
Any specific technology mentioned in this document is current as of today, however it may be subject to change in the future. Should the specification of the interface be changed, this will be notified by a new issue of this SIN. Openreach reserves the right to adapt technology to deliver WES as new developments are made. All WES Aggregations services are delivered as uncontended transmission paths (providing that at least one spoke is at 10Mbit/s if all ten spoke sites are used).

SPECIAL NOTICE
The WES Aggregation Link products will no longer be available for new supply with effect from 30 September 2016. The option to order new WES Aggregation Spokes is targeted to be withdrawn from 30 June 2017 subject to formal notification. Please refer to the product information available from the Openreach website (www.openreach.co.uk) for further details.

2 Service Outline

Figure 1. WES Aggregation service configuration

A schematic of the WES Aggregation service is shown in Figure 1.


Communication Provider's Site
GbE Aggregated Link to Customer site
OR
Local Handover to CP in
Route Length Limitation
Openreach Management
Two Handover Options
Customer site Handover
10 x RJ45 de-aggregated
1Gb VLAN separated
Local handover
1Gb VLAN separated only
BT Node / Exchange
Route Length Limitation
Un-contended
End Users' Sites (up to 10)
10 or 100Mbit/s

The WES Aggregation service provides an aggregated link with a hub and a maximum of ten spokes. An "End user" spoke may also be located within the Openreach Exchange CP area. If ten spokes are used, at least one spoke must be 10Mbit/s. This data service offers high bandwidth connectivity. This will be provided over radial distances up to 25km for spokes (between Openreach Node and End User sites). This radial (or point-to-point) distance can result in physical line plant route distances of up to 40 km for the spokes sites.

The interface offered on the spokes i.e. the Network Terminating Equipment (NTE) will be Ethernet operating at either 10Mbit/s or 100Mbit/s in full duplex mode, with a RJ-45 physical connection. Half Duplex mode is not supported. The uncontended transmission path is routed via the network between the third party customer site, via the point of aggregation, to the CP's network at a CP's site.

There are two options for handover to the CP:-

1) For Handover at a Remote CP PoP site - radial distances up to 25km is available for the aggregated link (between the BT Node and the CP's PoP). This radial (or point-to-point) distance can result in physical line plant route distances of up to 40 km for the Aggregated link. For handover at a CPs remote PoP site, this can be as an optical 1Gbit/s aggregated interface (with IEEE 802.1q[2] VLAN separated flows) or as 10 x RJ45 de-aggregated interfaces.

2) For Local Handover at the Aggregator site – handover will occur to the CP PoP at the aggregating exchange site. For local handover at the exchange site, this will be an optical 1Gbit/s aggregated interface only, (with IEEE 802.1q[2] VLAN separated flows).

The CP will have no access to the aggregating NTE. The CP will state their preference for the point of aggregation location as part of a pre-order process prior to placing any firm orders.

The service includes the IEEE 802.1d[1] Bridging functionality, which allows for the learning and filtering of traffic packets destined for those hosts connected at the local end. Packets destined for these local end (MAC) addresses will not be forwarded across the transmission path to the distant end after these (MAC) addresses have been learnt and until the system's cache memory has been refreshed after a host has been removed.

Each spoke connected to the Aggregation hub provides an uncontended transmission path to the PoP handover.

Resilience of the Aggregated link is only offered for handover at the CP's remote PoP site. Resilience is not available for Local Handover to CP PoP.

Service OAM functions, such as the ability to respond to IEEE 802.1ag Connectivity Fault Management messages, are not supported.

3 Customer Interface

3.1 End User and De-aggregated handover Interfaces

3.1.1 Connector

The interface is the Network Termination Point (NTP), i.e. the point of connection on the Openreach Network Terminating Equipment (NTE) for connecting CPE or CP equipment.

The Interface consists of an RJ-45 type socket. The CP / customer provides the category 5 connecting cords between the NTE and their own equipment. The maximum cable length is 100 metres.

The RJ-45 type connector is as specified in the 100BaseT IEEE 802.3[3] specifications.

Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard. It is the responsibility of the supplier of CPE or CP equipment to ensure that they have the necessary rights from the owner of the IPR. The IPR owner has stated that they are willing to negotiate licences under reasonable and non- discriminatory terms and conditions with applicants throughout the world.

The NTE connector socket pin outs are shown for information in Figure 2.

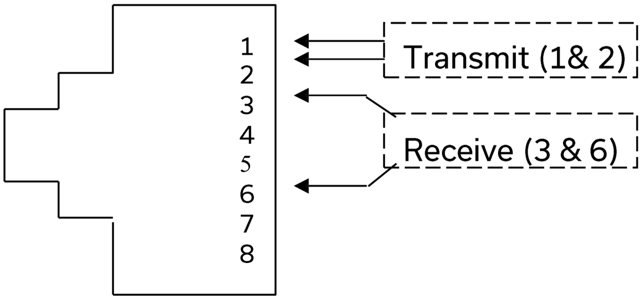


Figure 2. - WES 10/100 RJ45 Connector Pin Out Connections

3.1.2 Network Link Break/Link Loss Forwarding

When a break is detected on the Aggregated Link fibre of a de-aggregated handover service, a link down condition will be indicated on all RJ-45 spoke and CPs ports. This continues until such time as the network break is repaired.

In addition, the customer may specify that User-User Link Loss Forwarding is activated at the time of installation. This will mean that failure of one or more of a CP’s connections at the PoP site will be passed on to the respective spoke site(s), taking down the spoke site RJ45 port. However, a failure at the RJ45 port of a spoke site will not be propagated to the corresponding RJ45 port at the PoP site. This is known as 'Unidirectional User-User Link Loss Forwarding'.

When User-User LLF is specified by the customer in the CRF, it will be activated for all circuits - even though each circuit's LLF operates on an individual basis. Therefore, it is not possible to specify User-User LLF for some circuits, but not others on the same aggregating box.

If a fibre break occurs on a fibre link from the end user (spoke) site to the aggregator site, this will be indicated by a link-down condition on the RJ45 port at the affected spoke site, and also the corresponding RJ45 port and the de-aggregated handover site.

3.1.3 Transmission

The interface for 10Mbit/s running supports Ethernet, operating at 10Mbit/s. The interface requirements are specified in IEEE 802.3. Note that Half Duplex operation is not supported at 10Mbit/s. Auto-negotiation is not used and therefore customer equipment must have auto- negotiation disabled on the RJ45 ports

The interface for 100Mbit/s running supports Fast Ethernet running at 100Mbit/s. The interface requirements are specified in IEEE802.3. Note that Half Duplex operation is not supported at 100Mbit/s. Auto-negotiation is not used and therefore customer equipment must have auto-negotiation disabled on the RJ45 ports.

3.1.4 Transparency

The service is transparent to all Ethernet layer 2 Control protocols except those containing the multicast address for slow protocols (01-80-C2-00-00-02). Examples of such protocols that will be blocked by the WES Aggregation service include, Link Aggregation Control Protocol (LACP), Link Aggregation Marker Protocol and EFM OAM Protocol Data Units.

3.2 Aggregated handover Interface

Gigabit Ethernet conforms to the IEEE 802.3 standard. VLAN tagging is used to separate flows from different spoke sites. The VLAN format used is specified in IEEE 802.1q. It is the customer's responsibility to ensure that the throughput of any VLAN does not exceed the port speed of the associated spoke NTE (either 10Mbit/s or 100Mbit/s). On both the local and remote aggregated handover options, VLAN numbers 241 to 250 are used. These VLAN numbers provide connectivity to spoke sites 1 to 10 respectively on the aggregating NTE.

The interface is the Network Termination Point (NTP), i.e. the point of connection on the
Openreach Network Terminating Equipment (NTE) for connecting CPE
or CP equipment.

For remote CP site handover, the Interface consists of a Duplex LC type

1000BaseSX (multimode) or LX (single-mode) fibre interface port (not both on a single NTE). The CP / customer provides the fibre patch cable between NTE and CP equipment/CPE. The maximum fibre length between the NTE and CP equipment/CPE is 550 metres for SX (850nm multi-mode) ports when 50/125 micron optical patch cables are used or 220 metres if 62.5/125 micron optical patch cables are used. For LX (1310nm single-mode) ports, the maximum fibre length is 3 kilometres when a 9/125 micron optical patch cable is used.

The SX and LX type interface are as specified in the Gigabit Ethernet IEEE802.3 specifications.

For Local Handover options the CP's connection to the WES Aggregation aggregated interface is provided via an optical interface presented on:

- A CP owned and provided Interface Patch Panel

Only single-mode connectivity is provided to the Patch Panel. It is the CP's responsibility to ensure that connectors on the Interface Patch Panel for this service are designed for single-mode operation.

The interface connector at the end of the Openreach fibre tail presented to the CPs patch panel will be the Circuit Termination Point (CTP) and is the demarcation point of the WES Aggregation service. The customer must specify one of the following connector types:

- Duplex LC
- Duplex SC
- Dual FC/PC

The use of Angled connectors such as LC/APC and SC/APC are not supported. It is the responsibility of the CP to ensure that the connectors on the interface patch panel are for non-angled connectors, otherwise damage will occur to both the Openreach and CP optical interfaces and transmission performance will be impaired.

This LX (1310nm single-mode) port has a maximum fibre length of 3 kilometres when a 9/125 micron optical patch cable is used.

Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard. It is the responsibility of the supplier of the CP equipment or CPE to ensure that they have the necessary rights from the owner of the IPR. The IPR owner has stated that they are willing to negotiate licences under reasonable and non- discriminatory terms and conditions with applicants throughout the world.

3.2.1 Transmission

Note: The definition of frame length includes the 4-byte CRC but does not include any preamble.

The NTE is capable of transporting either untagged Ethernet frames or IEEE 802.1q VLAN- tagged Ethernet frames of up to 1996 bytes in length. The NTE can transport frames in both directions simultaneously (full duplex) at wire-speed without frame loss or error.

For the Local and Remote aggregated handover options Auto-negotiation must be enabled on the Gigabit Ethernet port on the CP/customer's equipment.

The NTE does not have the capability to intercept and/or view 'customer data'.

The WES Aggregation RJ45 Handover service can carry IEEE 802.1q VLAN tagged frames without restriction on the VLAN numbers that can be used.

However, the WES Aggregation VLAN (Local or Remote Handover) service requires an additional VLAN tag to be added by the CP corresponding to the destination spoke site, before presentation to the Aggregated Handover interface on the WES Aggregation NTE. In this case the outer tag, or S-VLAN tag as it is commonly known, must have a TPID value of 0x8100 otherwise the frames will be rejected by the WES-Aggregation NTE. CP's equipment must be able to accept and generate an S-VLAN TPID value of 0x8100.

Other commonly used TPID values such as 0x88a8 or 0x9100 are not supported on the outer tag.

There are no restrictions on the VLAN numbers or TPID values for the inner tag (C-VLAN tag) of double tagged frames.

3.2.2 Aggregated Link Break/Link Loss forwarding

If a fibre break occurs on a fibre link between the end user (spoke) site and the aggregator site, this will be indicated by a link-down condition on the RJ45 port at the affected spoke site. No indication will be given on the aggregated handover interface as this interface is shared by all of the spoke sites and the current technology does not provide fault localisation on a per-VLAN basis.

User-User LLF is not supported on the Local Aggregated Handover or the Remote Aggregated Handover (VLAN) service. Therefore a link-down condition at the CP's aggregated handover interface on the NTE will not be propagated to the spoke sites. In addition, failure at the RJ45 port of spoke sites is not indicated at the aggregated handover interface.

Therefore it will be the customer's responsibility to detect loss of Ethernet connectivity at the aggregator or spoke sites as they will not receive a link down condition at the NTE.

4 Power Supply

4.1 General

By placing an order with Openreach the customer has accepted the conditions placed by Openreach. In relation to powering of equipment, the customer must comply with the requirements of BS7671 and the details giving within the 'DC Power Planning and Installation Guide for WES-BES Products' document.

The End User sited Handover Units are dual AC only (except where an end user spoke site is located in the exchange, then AC or DC will be available). The power consumption of the End User NTE is not more than 50 watts

When used, the CP sited Handover Units are dual AC or DC powered. The power consumption of the CP sited handover NTE is not more than 95 watts..

The CP will be required to provide either a local 50Hz AC supply in the form of two standard 13 Amp power socket(s); or dual -50V DC power distributions and Earth connections, with all wiring colour schemes conforming to current BS7671 (IEEE Wiring Regulations) at the time of installation. It will be the customers' responsibility to ensure that the power supply is fused and safe for Openreach to use. These should be in close proximity to the NTE installation location.

4.2 Installation and Testing

In addition to the NTE and Chassis powering requirements below, a spare 50Hz AC mains supply 13A socket should also be provided in close proximity to the NTEs, to power BT test equipment during both initial commissioning and subsequent maintenance support activities.

4.3 AC Power connection

AC power connection between Openreach equipment and the power socket will be made using a standard IEC320 C13-14 power leads fitted with a standard 13A plugs.

This will require two mains connections for each NTE provided, and the consumption of the Openreach NTE and power unit chassis in this unmanaged service arrangement will be no more than 50 Watts per NTE.

4.4 DC Power Connection

The DC In-Line (Molex) connector is specified as the standard method of connecting DC power by Openreach, and represents the "Demarcation Point" between Openreach and the customer. At their site, the customer is required to provide suitable power and earth connection to, and be responsible for the supply, wiring and labelling to the demarcation point. Openreach will not supply or install the DC distribution system as part of the standard Ethernet installation.

- Customer provided wiring up to the Openreach specified In-Line connector.

Wiring, MCB isolation or fuse (i.e. C Type MCB or Cartage Fuse), must be provided by the customer, up to and including the DC in-line connector, as per Openreach's requirements stated within the 'AC/DC Power Planning and Installation Guide document with respect to;

(i) Correctly rated MCB/Fuse, refer to the WES Aggregation product handbook for correct rating

(ii) Correct labelling of wiring and MCB/fuse positions compliant with

BS 7671, (iii) Correct size of cable for required voltage drop at

required maximum current,

(iv) Separately fused isolatable A & B power supplies, as detailed in the 'AC/DC PowerPlanning and Installation Guide document.

The in-line connector has a maximum current handling capability of 11A, and is not to be used for equipment requiring greater than a 11A supply (such as the Nortel OPTera 5200 equipment, which require 20A feeds).

4.5 Additional Details

For further details on the provision of DC Power, see the 'AC/DC Power Planning and Installation Guide f' available on the Openreach Ethernet website.

If there is a conflict between DC power information contained in the 'AC/DC Power Planning and Installation Guide and the SIN document, the order of precedence shall be as follows:

(a) AC/DC Power Planning and Installation Guide

(b) SIN

5 Customer Apparatus Design / Installation Advice

The aggregate handover variant of the service has been designed such that any vendors' switch or router that support the use of IEEE 802.1q VLANS and have IEEE 802.3 compatible interfaces of the 1000BaseSX or 1000BaseLX variety will be able to connect to the handover NTE. The service provider's equipment must be able restrict the bandwidth of any VLAN so that it does not exceed the port speed of the associated spoke NTE (either 10Mbit/s or 100Mbit/s). Without this capability, Ethernet traffic may be lost on one or more spoke links. Bandwidth limiting is the service provider's responsibility.

The Link Loss Forwarding function is not supported on the Aggregate Handover service as the Gigabit Ethernet interface is common interface to all spokes, and current technology cannot provide this feature on a per VLAN basis. It will be the customer's responsibility to detect loss of Ethernet connectivity and not rely on a customer port link down condition on the NTE.

Due to the use of a common Gigabit Ethernet interface it will not be possible to prove VLAN separated handover links end-to-end using external testers without disconnecting the Gigabit Ethernet interface. This means that no end-to-end test can be carried out unless all spoke circuits are put out of service. For these reasons, testing of initial links (and subsequent spokes) will be carried out remotely through the management system.

The De-aggregated handover variant uses individual 10/100Mbit/s RJ45 interfaces for each associated spoke. The customer port on the spoke NTE and the associated handover NTE port will be set to the same speed (10Mbit/s or 100Mbit/s) depending on the service, therefore no traffic limiting is required. The Link Loss Forwarding feature is available for this variant of the service and will propagate a network fibre break condition on either the spoke or main link by shutting down the appropriate RJ-45 port on the spoke and handover NTE.

The dimensions of the FSP150 chassis are:-

NTE Type:	Height	Width	Depth	Weight:
FSP150 CP, MO, ME and MG	(1U) 44mm	438mm	212mm But 300mm with space for fibres and power feed	3.5kg

6 Further Information

For enquiries concerning connection availability between particular sites and for further information on the Openreach WES Aggregation Service, please contact your Openreach Sales & Relationship manager, or see http://www.openreach.co.uk/orpg/home/products/ethernetservices/aggregation/aggregation.doc

7 References

IEEE Standards:

Ref:	Standard / Requiremen	Title	Date:
[1]	IEEE 802.1d	IEEE Standard for Local and metropolitan area networks - Media Access Control (MAC) Bridges	2004
[2]	IEEE 802.1q	IEEE Standards for Local and metropolitan area Virtual Bridged Local Area Networks	2003
[3]	IEEE 802.3	Carrier sense multiple access with collision detection	2005
[4]	IEC 60320	Appliance couplers for household and similar general purposes	

For further information or copies of referenced sources, please see document sources at https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do

8 Abbreviations

AC	Alternating Current
CBM	Customer Business Manager
CP	Communications Provider (Provider of Electronic Communications
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check
CSMA / CD	Carrier Sense Multiple Access with Collision Detection
DC	Direct Current
EBD	Ethernet Backhaul Direct
FC/PC	Fibre Connector/Physical Contact
IEC	International Electrotechnical Commission
IEEE	Institute of Electronic & Electrical Engineers
IPR	Intellectual Property Rights
LC/PC	Lucent Connector/ Angled Physical Contact
LLF	Link Loss Forwarding
LX	Long Wavelength (1310nm)
MAC	Media Access Control
MCB	Mini Circuit Breaker
NTE	Network Terminating Equipment
NTP	Network Terminating Point
PoP	Point of Presence
RJ45	Registered Jack 45
SC	Subscriber Connector
SIN	Suppliers' Information Note
SX	Short Wavelength (850nm)
VLAN	Virtual Local Area network
WES	Wholesale Extension Service

9 History

Issue 1.0	1 Sep 2006	First issue.
Issue 1.1	29 Sep 2006	Contact information updated.

Issue 1.2	7 Mar 2007	Contact details in "Further Information" clause updated.
Issue 1.3	30 Oct 2007	Service description amended in accordance with updated DC power guidance
Issue 1.4	25 June 2009	Added line to specify that the End User sited Handover Units are dual AC only. Removed section on 16-slot NTE chassis and associated power requirements. Also made editorial clarifications and updated references.
Issue 1.5	9 April 2010	Amendments made to Section 3.2 "Aggregated Handover Interface"and section 3.2.2."aggregated Link Break/link Loss Forwarding"
Issue 1.6	June 2010	Section 3.1.4 Transparency added and 3.2 .1 "transmission" amended.
Issue 1.7	August 2012	Amendments made to Sections 4.3, 4.4 and 6 to update of the reference and URL to the AC/DC Power Planning and Installation Guide power document.
Issue 1.8	August 2012	Change SINet site references from http://www.sinet.bt.com to http://www.btplc.com/sinet/
Issue 1.9	June 2016	Addition of notice to advise that WES Aggregation Link products will no longer be available for new supply with effect from 30 September 2016
Issue 2.0	August 2020	Changes to branding, from BT to Openreach including changes to reflect new Openreach SIN site and Openreach SIN email address
Issue 2.0	July 2021	Annual Review – no changes required – issue remains unchanged.
Issue 2.0	July 2022	Annual Review – no changes required – issue remains unchanged.
Issue 2.0	July 2022	Annual Review – no changes required – issue remains unchanged.
Issue 2.0	September 2023	Annual Review – no changes required – issue remains unchanged.
Issue 2.0	October 2024	Annual Review – no changes required – issue remains unchanged.

-END-